CONCORDIA UNIVERSITY
FACULTY OF ENGINEERING AND COMPUTER SCIENCE
DEPARTMENT OF MECHANICAL INDUSTRIAL & AEROSPACE ENGINEERING

Thermodynamics I (ENGR 251), Fall 2018, Section T

Instructor: Dr. Lyes Kadem, ing, Room EV 4.207
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Tel: 848-2424 #3143
Office Hours: Tuesdays and Thursdays and 9:00 -10:00 am
Outside office hours, just bring some chocolate ;-)
Note: Do not even think about getting the chocolate from the Dollarama
Website: http://users.encs.concordia.ca/~kadem/ENGR251.html

Moodle website: **NO**
Prerequisites: MATH 203 (CEGEP Mathematics 103)
This course is a prerequisite for: ENGR 361; MECH 351; BLDG 365

Lectures: **T:** Tuesdays and Thursdays 10:15 – 11:30 SGW, H-535.
Tutorials:

TA	MB S2.115	Friday 11:45 – 13:25
TB	MB 5.265	Friday 16:15 – 17:55

IMPORTANT NOTE: THIS COURSE OUTLINE IS COMMON TO ALL FALL/WINTER/SUMMER ENGR251 SECTIONS

OBJECTIVES

The fundamentals of thermodynamics, including applications of the first and second laws, enthalpy, entropy, and reversible and irreversible processes. The objectives of the course are to present a comprehensive treatment of classical thermodynamics within the framework of an engineering technology curriculum. The course prepares the student to use thermodynamics in applications typically found in professional practice.

NO-TEXTBOOK

A course pack and a problems pack can be freely downloaded from the course website. *Because buying a textbook at $300 is unstainable… and this is against the laws of thermodynamics.*
All course notes can be downloaded from the course website:

http://users.encs.concordia.ca/~kadem/ENGR251.html

Additional References
- “Thermodynamics: An Engineering Approach” by Cengel and Boles, Any edition, McGraw Hill.
- "Fundamentals of Thermodynamics" by Sonntag, Borgakke, and Van Wylen, Any edition, John Wiley & Sons, Inc.
- “Thermodynamics” by K. Wark, Any edition, McGraw Hill.
- “Fundamentals of Engineering Thermodynamics”, Moran, M.J. and Shapiro, H.N., Any edition, Wiley.

GRADUATE ATTRIBUTES

ENGR251 emphasizes and develops the CEAB (Canadian Engineering Accreditation Board) graduate attributes and indicators:

ATTRIBUTE	INDICATOR	LEVEL OF KNOWLEDGE
A knowledge base for engineering *Demonstrated competence in university-level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.*	Knowledge-base of natural science	INTRODUCTORY
Problem analysis An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.	Problem identification and formulation	INTRODUCTORY
	Problem solving	INTRODUCTORY
	Analysis (uncertainty and incomplete knowledge)	INTRODUCTORY

Course Learning Outcomes (CLOs)

Understand the basic concepts such as change in state, thermodynamic path, cycle, state postulate and thermodynamic scale (zero law of thermodynamics).	**A knowledge base for engineering/** Knowledge-base of natural science
Evaluate the thermodynamic properties of pure substances.	**A knowledge base for engineering/** Knowledge-base of natural science **Problem analysis/** Analysis (uncertainty and incomplete knowledge)
Apply the first law of thermodynamics to closed systems and determine the exchange in energy involved with the surroundings.	**A knowledge base for engineering/** Knowledge-base of natural science **Problem analysis/** Problem identification and formulation **Problem analysis/** Problem solving
Apply the first law of thermodynamics to open systems and determine the exchange in energy and mass with the surroundings.	**A knowledge base for engineering/** Knowledge-base of natural science **Problem analysis/** Problem identification and formulation **Problem analysis/** Problem solving
Analyze simple thermodynamic cycles using the 1st law of thermodynamics.	**A knowledge base for engineering/** Knowledge-base of natural science **Problem analysis/** Problem identification and formulation **Problem analysis/** Problem solving
Understand the limitations of the first law of thermodynamics and the need for the second law of thermodynamics.	**A knowledge base for engineering/** Knowledge-base of natural science **Problem analysis/** Analysis (uncertainty and incomplete knowledge)
Apply the concept of Carnot efficiency to thermodynamic cycles.	**A knowledge base for engineering/** Knowledge-base of natural science **Problem analysis/** Problem identification and formulation **Problem analysis/** Problem solving
Utilize the concept of entropy to assess the feasibility of a thermodynamic process.	**A knowledge base for engineering/** Knowledge-base of natural science

KNOWLEDGE BASE FOR ENGINEERING PREREQUISITES:

This course requires a very good knowledge in:
- Basic integration for calculus.
- Basic differentiation.
- Basic knowledge in numerical interpolation.

The knowledge base for engineering required for this course will be tested during Quiz I.

PRACTICE EVALUATION

Quiz I	**3.0% (September 14th in Tutorial)**
Quiz II	**7.5% (Tentative date: 5/10)**
Quiz III	**7.5% (S2S project; Students to Students project)***
Midterm exam	**27% (Tentative date: 8/11)**
Final exam (closed book and notes)	**55%**

However you *must* pass the final examination with a >50% grade to pass the course.

ALL exams are mandatory and **ALL** exams will be counted.

(*) S2S project: Students will have to record a short video (up to 5 minutes) explaining of the topics listed below. By posting the videos, future students will be exposed to different ways of explaining the same topic (for example, the second law of thermodynamics). This project can be done individually or as a team of maximum four members.

List of topics: What is thermodynamics?; Properties tables; Phase diagrams; Heat and work; Equation of states; 1st law of thermodynamics; 2nd law of thermodynamics; Gas Power and vapor Cycles; Carnot principle; Entropy

Main Topics

- Basic Concepts of thermodynamics.
- Properties of pure substances.
- Energy transfer by heat, work and mass.
- The first law of thermodynamics.
- The second law of thermodynamics.
- Entropy

Disclaimer: "In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change".

NOTE: THIS SECTION IS SPECIFIC TO: ENGR251 SECTION T

REPLACEMENT OF AN EXAM POLICY

Any missing quiz or midterm will be replaced by an oral theoretical examination (not necessarily covering the same topics as the quiz or the midterm)

SOME BASIC CLASSROOM RULES

1- Please do not start an email with “Hi”, “Yo”. Start it with a formal salutation.
2- Never complain that work in another, far more important class is stopping you from doing your job in this course.
3- Make sure that your grandparents stop dying, all at once and during exams. Take CPR if necessary.

Unofficial course outline

The 2nd Law: Unsustainable
By Muse

All natural and technological processes
Proceed in such a way that the availability
Of the remaining energy decreases
In all energy exchanges, if no energy
Enters or leaves an isolated system
The entropy of that system increases
Energy continuously flows from being
Concentrated to becoming dispersed
Spread out, wasted and useless
New energy cannot be created and high grade
Energy is being destroyed
An economy based on endless growth is
Unsustainable
Unsu
Unsustain unsustain unser
Uns' uns' unsustainer unsustainer
Unsu
Unsustain
Unsustain
Uns' uns' you're unsustainable
The fundamental laws of thermodynamics will
Place fixed limits on technological innovation
And human advancement
In an isolated system, the entropy
Can only increase
A species set on endless growth is
Unsustainable
Unsu
Unsustain unsustain unser
Uns' uns' unsustainer unsustainer
Unsu
Unsustain
Unsustain
Uns' uns' you're unsustainable